(3) Preparations that are, or that may be, used for illegal purposes, such as abortifacients.

(4) Preparations already classed as being "alcoholic medicinal compounds" or such as are found to contain excessive quantities of alcohol or of habit-forming drugs. Or,

(5) Preparations the names of which suggest curative properties or specific action in certain diseases.

From a review of the thoughts and suggestions embodied above it would appear that if we accept the validity of the abstract thesis that individuals have the right to medicate themselves, we must also admit that the right of the individual to take or to refuse to take remedies is to a considerable extent limited by the nature of the ailment involved and by the probable outcome of the policy pursued from the point of view of its effect on the well being of the community at large.

The individual who desires to medicate himself should know that the human body is a complex aggregate of cells, the metabolic functions of which may be interfered with in many ways, and that no two organisms will react exactly alike under given conditions.

A medicine to be recognized as such is of necessity as potent a factor for harm as it can be for good, and should therefore be classed as a poison.

The ingestion or the use of a poison is fraught with dangers, and in order to minimize the possible harmful results the individual taking a medicinal preparation on his own initiative should be thoroughly well informed as to the nature and characteristics of the drugs he is taking and the untoward effects that may be expected.

IMPOUNDED WATERS.

A STUDY OF SUCH WATERS ON THE COOSA RIVER IN SHELBY, CHILTON, TALLADEGA, AND COOSA COUNTIES, ALA., TO DETERMINE THE EXTENT TO WHICH THEY AFFECT THE PRODUCTION OF ANOPHELINES, AND OF THE PARTICULAR CONDITIONS WHICH INCREASE OR DECREASE THEIR PROPAGATION.

By J. A. A. Le Prince, Sanitary Engineer, United States Public Health Service.

Under instructions from Surg. R. H. von Ezdorf, of the United States Public Health Service, and after a conference with State Health Officer W. H. Sanders, of Alabama, a survey was made, during October and November, 1914, of the water of the Coosa River impounded above Lock No. 12. The dam is located at the proposed lock site of Lock No. 12, and was completed in the spring of 1914. It is located about 14 miles from Clanton, Chilton County, Ala. It was constructed by the Alabama Power Co., and the impounded water extends for about 20 miles upstream from the dam. At the request of the State health officer of Alabama, Dr. W. H. Sanders, the Ala-

bama Power Co. accomplished a large amount of clearing of trees within the area to be flooded before the dam was completed and water impounded.

The State health officer requested that—

(1) All timber be removed from the zone of territory surrounding the proposed reservoir that will sometimes be inundated and at other times exposed, the standing trees and growth to be cut as near the ground as can be conveniently done.

(2) Further, whenever considerable bodies of timber stand inside of, but contiguous and near to, this zone that will not at any time be wholly submerged, such bodies of timber should also be removed.

(3) That the formation of standing pools of water on the above-defined zone of territory during recession of the water in the reservoir should be prevented by cutting ditches wherever needed.

The survey was made by J. A. A. Le Prince, United States Public Health Service, accompanied by J. V. Donley, sanitary engineer Alabama State Board of Health, during the period October 13 to November 16, 1914.

A large part of the shore line of the main channel has been very well cleared of trees and shrubs. The work was expensive and in many places was properly performed. It is unfortunate that apparently the person or persons directly in charge of the clearing had little knowledge of the object to be attained. In many places the upstream ends of inlets were not cleared at all, and, again, brush and branches, stacked ready for burning, were allowed to remain unburnt on relatively flat ground and were not completely submerged by the water. At some of the inlets or bays of the lake no attempt was made at clearing, as, for example, near the lower end of Paint Creek and the successive inlets above Paint Creek on the same side of the lake, up as far as the Waxahatchee River. In many instances cut trees, close to the present bank of the river, are but partially submerged. At a place opposite Ida, where the land is covered with a shallow sheet of water, the logs of cut trees were left lying on the ground where they fell, and were only partially submerged, or submerged at time of maximum water elevation.

Better results would have been accomplished if a more limited clearing had been properly and thoroughly accomplished, and logs and branches destroyed by burning (*a*) in all places where there was little or no wave action, (*b*) on land covered by a relatively shallow sheet of water. It would have been better had no pine trees been left standing in water or close to the water's edge.

In many cases where logs were only partially submerged they served as an obstruction and caused a collection of floating sticks and débris, among which larvæ [1] and pupæ of Anopheles were found.

[1] Wherever larvæ is mentioned in this report larvæ of Anopheles is understood.

Also, where the bark remained on such logs the larvæ were found apparently clinging to the logs. This did not occur where the water close to the logs was subjected to heavy wave action or where small top-feeding minnows were present.

The water located between abrupt ridges, forming inlets, is well protected from wind, and the greater part of the 30 inlets examined were of this character. They are indicated on the attached map. Their upper ends are practically free from wave action and so become more important as a source of Anopheles than the exposed shore line of the lake proper.

The inspection indicated most clearly that it is important to clear and to remove logs and branches at the upper ends of the inlets, and that this is of more importance than logs on the shore of the lake proper, which are subject to wave action.

In the area examined, the topography is such that very little of the floating débris on the surface of the lake is cast up on the shore. Pine trees are very numerous. Many are located close to the banks and some were allowed to remain in areas that are flooded. They are numerous also in the valleys of streams and creeks that flow into the lake. It was soon found that the leaves of the pine trees that fell into the lake, or those that were carried into it by streams, collected into large or small groups and afforded most excellent protection for mosquito larvæ. They constitute the most important factor for the production of Anopheles larvæ in the lake, as well as in some of the streams beyond and outside of the influence of the impounded waters.

It is safe to state that over 90 per cent of the Anopheles larvæ and pupæ collected in the lake were taken by dipping among collections of pine needles, where they were found in all stages of development. Often no larvæ at all could be found by dipping directly along shore of an inlet for a distance of half a mile or more, yet they could generally be found by skimming the surface of any group of pine needles off shore or close to the shore. In some groups of pine needles they were quite numerous. At the upper end of many inlets pine needles were present in relatively large numbers, with a corresponding large number of Anopheles pupæ and larvæ in all stages of development. Frequently, where pine needles were absent, Anopheles larvæ were either very scarce or absent; where pine needles were present in collections of débris, the larvæ were almost invariably to be found alongside of a floating pine leaf, rather than against a piece of bark, twig, or other débris. It seemed to make no difference whether the pine-needle groups were close to the shore, or 2 or 10 feet off shore; their attraction for Anopheles appeared to be the same. The conditions of the streams or natural drainage courses discharging into the upper ends of inlets are such as to favor the

washing down of large number of larvæ and pupæ, as well as pine leaves.

There are a number of inlets caused by the impounded water from the lake, well protected against the influence of wind and into which no streams discharge, where pine leaves have collected, and where Anopheles larvæ, large and small, were found in numbers.

It was evident that collections of floating pine needles not only offered an excellent protection to the larvæ, but were apparently places of selection.

In the dead water of Cedar Creek, near the county highway bridge, the grass on the banks had grown quite long and had fallen over, so that much of it floated on the water surface. Larvæ and pupæ of *Anopheles punctipennis* were found in numbers in this grass.

Wherever larvæ were present in inlets examined, with the exception of Waxahatchee and Cedar Creeks, they were generally more numerous at the upper ends and most numerous at the extreme end, whether there was a stream discharging into the inlet or not.

The relative importance of places where larvæ were found in the lake was in the following order:

1. Groups of pine needles (when not too closely compact).
2. Débris—consisting of bark, leaves, and twigs.
3. Long grass lying on the water surface (only noted at Cedar Creek).
4. Dead leaves of trees floating on the surface (present from September to November).
5. Logs, branches, stumps, etc.

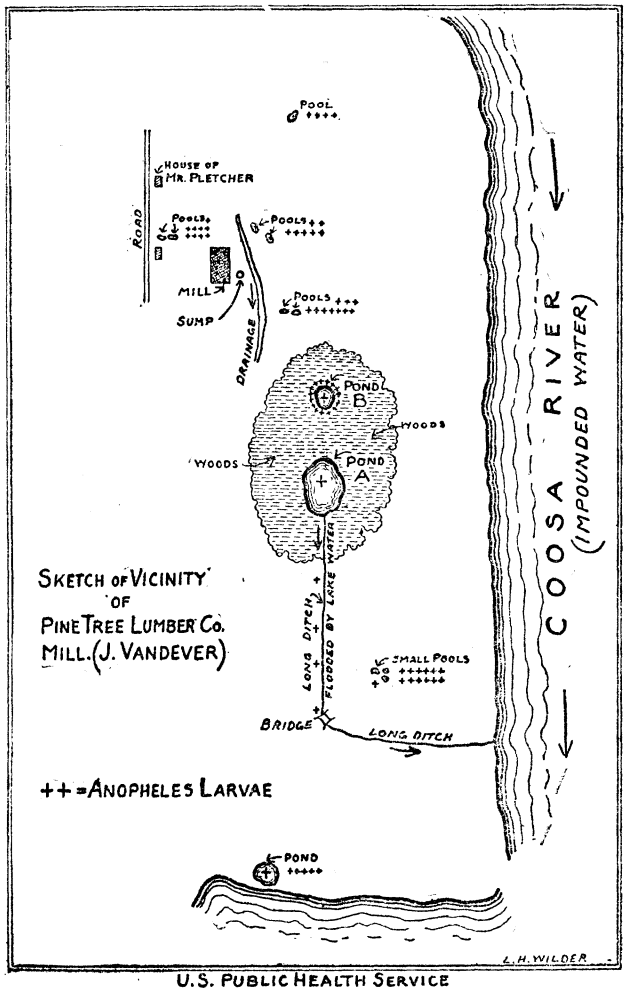
This inspection was made during the late autumn, so that conditions during late spring and midsummer may be entirely different. In order to determine these conditions, it will be necessary to make further examinations in the summer season.

The people living near the lake all report that mosquitoes were much more numerous during the present year than in past years.

It is reported that the weather has been unusually dry this season, and just how that would affect the production of Anopheles in the locality under consideration has not yet been determined.

It was not possible to examine all streams and pools in the country surrounding the impounded water. Of the small streams beyond the influence of impounded water emptying into the lake, a large number contained Anopheles larvæ. Several streams below the dam were examined, and all contained Anopheles larvæ. Wherever small pools in the roads near houses and settlements were examined, they were found, almost without exception, to contain enormous numbers of Anopheles larvæ and pupæ. As the inspection was made at the end of a long period of drought, the number of such breeding places and their relative importance as compared with the lake could not be estimated. Undoubtedly they are an important factor. With the exception of a few houses near the steel bridge on

the Waxahatchee Creek, nearly all houses seen were relatively close to pools or streams that contained Anopheles larvæ and pupæ and were beyond the influence of the impounded water from the lake. In such pools the larvæ of Anopheles were very much more numerous per unit of area than at any place in the lake. Near Ida, Cedar Creek, Slaughter Creek, north of Talladega, and at other points, the



lake has caused flat or gently sloping grass-covered lands to become flooded with a shallow layer of water.

At the time of inspection practically no Anopheles were found in such areas. It was believed that these conditions were influenced by the changing elevations of the lake and that Anopheles larvæ may occur in such areas during the summer months when algæ may be present. Near an abandoned mill belonging to Mr. J. Van Dever, and

also near his present mill, are flat-flooded areas where algæ have been present in quantity during the past summer, which might have been an important source of Anopheles. It had apparently been rendered nonproductive, due to the lowering of the lake elevation, and would have to be reinspected to determine its relative importance in producing Anopheles. The small pools near the road and close to the mill in operation at the time of this examination were found to be productive sources for Anopheles.

During the hot summer months there should be a much more general distribution of algæ (spirogyra) than was found during the survey, which may be an important factor in some of the more shallow arms of the lake. Again, it is possible that more adult *Anopheles crucians* or *Anopheles quadrimaculatus* develop before October 1 than after that date, and if so adults of these species should be seen more frequently than they were seen by the observers between October 15 and November 15.

Between 9 and 10 o'clock p. m. November 4, and up to dark the following evening, November 5, several observers remained in the woods close to a prolific breeding area and did not see or feel a single mosquito.

Such conditions were unusual and are not likely to occur earlier in the season.

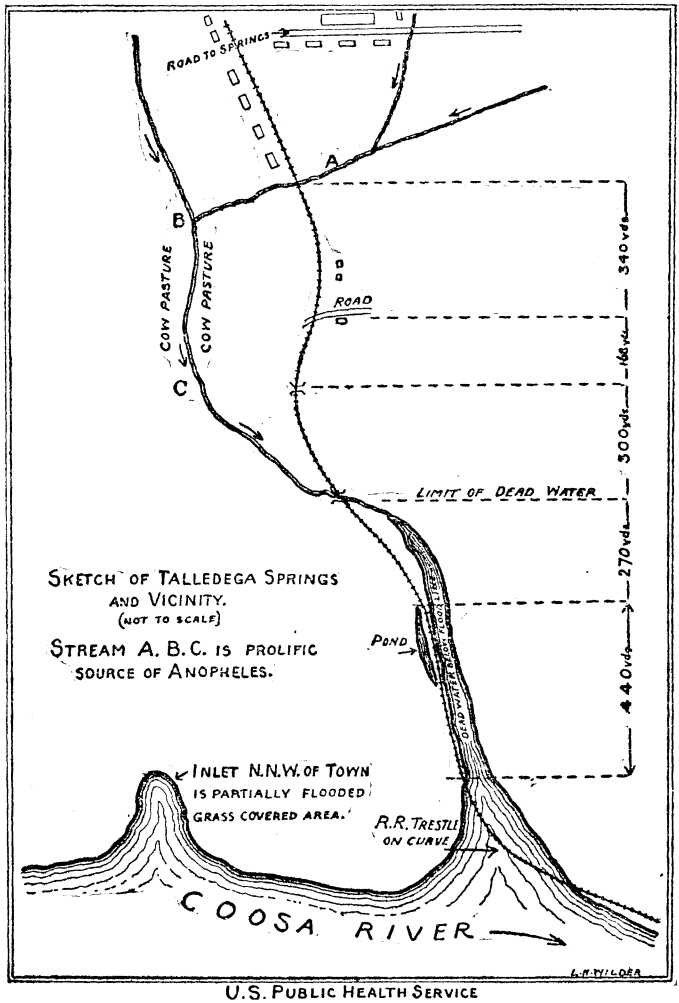
The survey was started late in the season and it was well known that of necessity its scope had to be limited, so the work was confined largely to an examination of the shores of the lake, and in particular to those inlets and branches of the lake likely to contain many Anopheles larvæ and pupæ.

An examination was made of the lower portion of running streams above the influence of the lake, but there was not sufficient time to examine these to their sources. The upper portions of several streams examined not far from Lock No. 12 were found to contain larvæ and pupæ. In nearly all of the streams examined which were located near houses, but beyond the influence of the lake, Anopheles larvæ and pupæ, as well as those of Culex, were encountered.

It was reported that the lake had caused water to collect in depressions on flat land having an elevation below that of the surface of the lake. Such conditions are said to exist more in the northern portion. As the survey was made largely in the lower part of the lake, only two such depressions were noted—one south of the Van Dever mill and another near Cedar Creek. The latter was undoubtedly produced by the lake and contained both Anopheles and Culex larvæ.

It is unfortunate that we did not have the time and opportunity to examine all the territory surrounding the lake to determine to what extent Anopheles production occurs in the streams, drainage courses, pools, etc., which may exist and which would be of considerable

importance in their relation to populated regions. In the inspection of the Waxahatchee Creek it was noted that above dead water the conditions are about the same as immediately below it, and Anopheles larvæ in both cases were protected by floating leaves. It is reported that before the lake was formed this creek contained a series of relatively quiet stretches of water; and if such was the case, undoubtedly mosquito production occurred at various points along its banks.



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The time devoted to the survey did not allow of an examination of the Coosa River above the dead water. Below the dam Anopheles larvæ were taken at one or two points. To what extent production of Anopheles occurred at the edges of the Coosa River, now covered by the lake, before the impounding of water, can not be determined at this time.

There is a scarcity of top-feeding minnows throughout all parts of the lake examined. In the few places where minnows were found Anopheles were either very few or absent. The larger fish which prey upon minnows are very plentiful, and so probably prevent the increase of the smaller species. All persons questioned reported that minnows are most excellent bait, and that a sure catch of larger fish is possible if one can obtain minnows. On the upper part of Waxahatchee Creek is a pond known as Shraders Mill Pond, which is very well stocked with a species of top-feeding minnows, marked by a black stripe on each side. The surface of the water along the edges of the pond contained groups of pine needles, collections of floating débris, and many dead leaves which were falling from the trees at the time of inspection, October 28. The conditions were ideal for the prolific production of Anopheles. No larvæ were found. The top-feeding minnows were apparently able to dispose and did dispose of all larvæ and prevented development of Anopheles in this area. It is thought that by removing the minnows from this pond during the mosquito-breeding season conditions would at once favor mosquito and Anopheles development. Such conditions would be rapidly produced by stocking the pond with a relatively large number of larger fish that destroy top-feeding minnows. It is very probable that there has been a rapid increase of large fish recently in the area covered by the lake. As has been already stated, the survey has not been completed, and it is too early yet to draw conclusions.

The following is a summary of facts that were determined by the survey:

1. The shore line of the lake and its arms were examined, as well as nearly all pools and streams, during the period of 24 days, October 13 to November 16. Collections of mature mosquito larvæ and pupæ were made each day with the object of determining the species of Anopheles.

2. A total of 1,271 adult mosquitoes emerged from material collected. Of these, 1,152 were *Anopheles punctipennis;* 18 culex (species not determined), and 101 *Anopheles quadrimaculatus.* Of the 101 quadrimaculatus, 65 were taken in one small area at the lower end of Paint Creek, 18 in Waxahatchee Creek, and only 18 in all other places visited.

3. Considering the time spent in collecting larvæ and pupæ, with the exception of the limited area in Paint Creek, the number of *Anopheles quadrimaculatus* collected was very small. Also, the number of adults of this species found on logs and in other natural hiding places near the inlets examined appeared at the time of the survey too small to have any practical bearing on the spread of malaria in the surrounding country.

4. It was noted that wherever the adult larvæ and pupæ of *Anopheles punctipennis* were numerous, adults of this species were to be found resting on logs and stumps, and at the base of tree trunks. Near the only important breeding places of *Anopheles quadrimaculatus* found (area shown on the map on Paint Creek) the adults of this species were present. On the morning of November 4, 21 adult *Anopheles punctipennis* and 8 *Anopheles quadrimaculatus* were taken between 10.30 and 11.30 a. m. close to this breeding area. These were more adult *Anopheles quadrimaculatus* than were noted close to breeding places during the entire survey, although a careful search was made for them daily.

In areas covered by other surveys made in various parts of the Southern States during the summer, adults of the latter species were always found in considerable numbers wherever convenient and suitable hiding and resting places occurred not far from important propagation areas.

5. It follows from the above that with one limited exception, so far as could be observed at the time the survey was made, those parts of the lake that were examined were not important so far as producing *Anopheles quadrimaculatus* is concerned. This does not mean that such areas may not produce this same species in considerable numbers between June and September, and no proper conclusions can be drawn until a thorough examination has been made at that time of the year. The same was true regarding streams passing near houses in the area affected, streams discharging into the lake and ponds, and pools close to the lake.

6. Floating débris and particularly pine leaves are more important in producing Anopheline breeding places in the late autumn than are floating logs. Brush and young trees when close together serve as resting places for collections of débris, and, as such, are more important than logs. Where small top-feeding minnows are present in numbers in the absence of débris, the number of Anopheles larvæ found at the sides of floating logs are few, and they are frequently absent in such localities.

7. The scarcity of small larvæ-destroying fish in the lake during the present year is the reason why many larvæ and pupæ of *Anopheles punctipennis* were present at some of the inlets examined.

8. It should be mentioned that with the exception of live pine trees, trees left standing in the water, if not close together, are not as important in assisting propagation of Anopheles as are brush, tall grass, and saplings. That the small twigs falling from the dying trees, if collected in one place and close together, may harbor larvæ, but if many small top-feeding minnows are present, mosquito larvæ alongside of logs and tree stumps have but little chance to reach maturity unless other protection, such as débris, leaves, etc., are present.